MONITOR FCX

INSTALLATION AND SERVICE MANUAL

Fully Condensing Oil Fired Heating System Efficiency, Up to 95% efficient

MONITOR PRODUCTS, INC.
www.monitorproducts.com

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FCX INSTALLATION AND SERVICE MANUAL

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I. INTRODUCTION

1 - PRODUCT DESCRIPTION

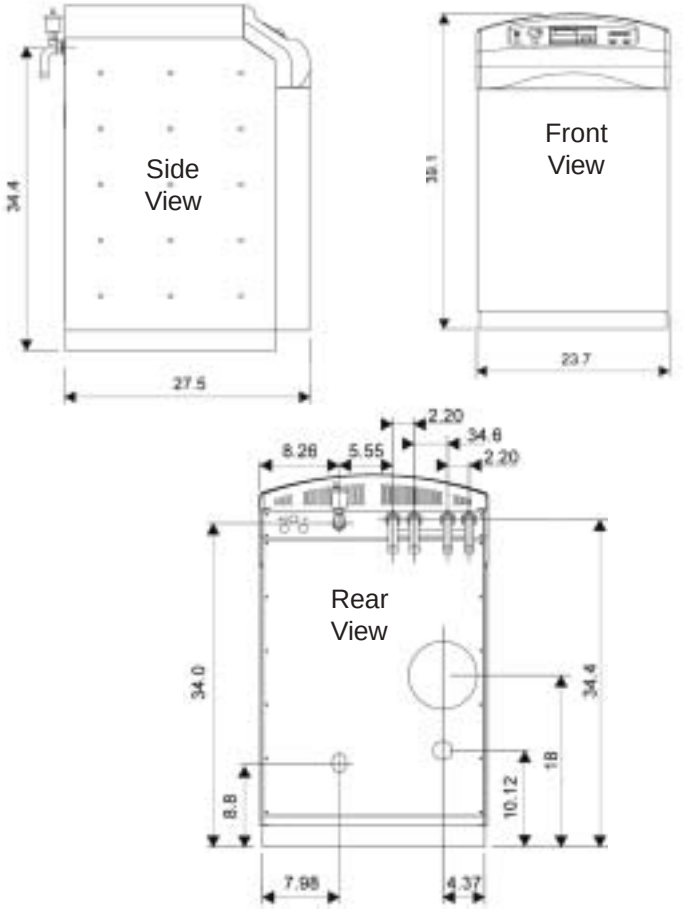
Model FCX oil fired heating system utilizes a sealed combustion system that operates at a temperature at which the flue products will condense. How much the unit condenses depends on return water temperatures. The lower the temperature the more the unit condenses and the high the efficiency. The flue products temperature is so low that the unit is suitable for use with PVC intake / Polypropylene exhaust flue pipes, which are offered as standard options for installation. The FCX is approved for installation with zero clearance to combustible materials by Intertek Testing Services to the UL Standard for Oil Fired Storage Tank Water Heaters (UL 732).

The FCX is completely assembled and provides standard parts as follows:

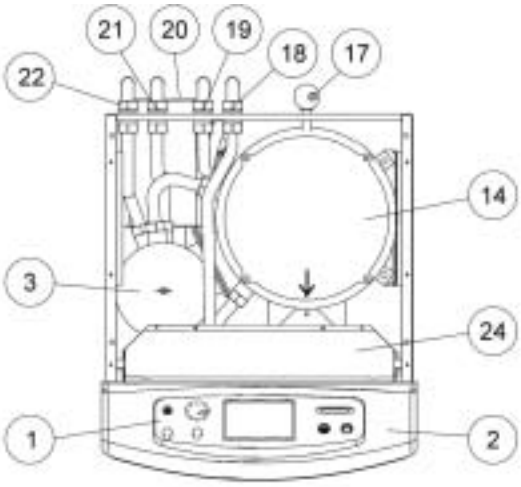
- An enameled steel cabinet with thick insulation
- A completely unitized, thick shelled heating system with combustion chamber and a heat exchanger with a system of removable baffles
- A stainless steel condenser, with condensate drain
- A high efficiency, low emission, gun type oil burner with combustion air fan, integral oil pump, oil heater and primary control
- A control panel assembly and all electrical controls for operation of the heating system, including a water temperature thermometer in circuit 1
- A manual water-mixing valve that can be motorized if desired
- A safety pressure relief valve
- An expansion tank
- A water circulating pump
- Complete internal water piping terminating in connections for two independent water heating circuits.
- Complete internal air piping terminating in a connection to a coaxial flue/combustion air intake system.

Standard options available from Monitor include:

- Coaxial balanced flue system components for connection to the heating system to provide venting of the flue products and combustion air intake.

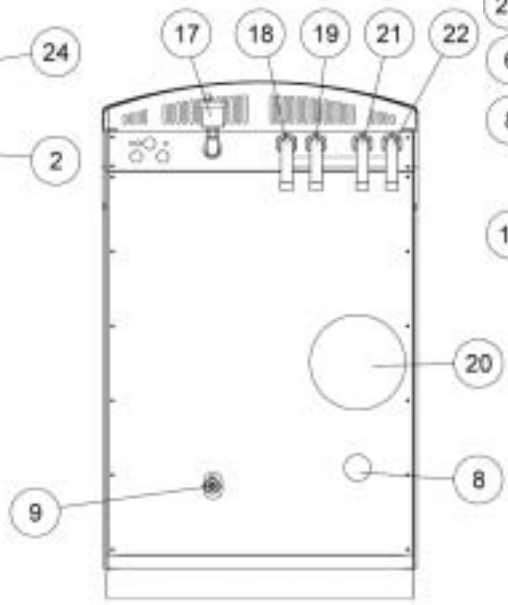


2 - DESIGNATION OF COMPONENTS

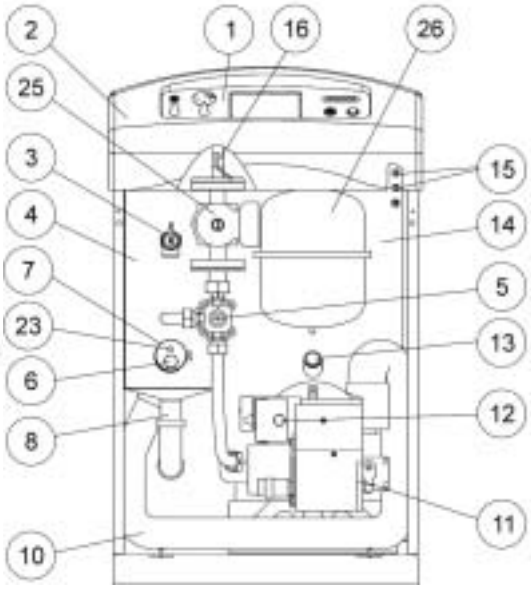


View from above

1) *Control Panel*
2) *Control Panel Cover*
3) *Safety Pressure Relief Valve*
4) *Condenser*
5) *Manual Mixing Valve*
6) *Combustion Product Pressure Test Point*
7) *Condenser Inspection Port*
8) *Condensate Drain*



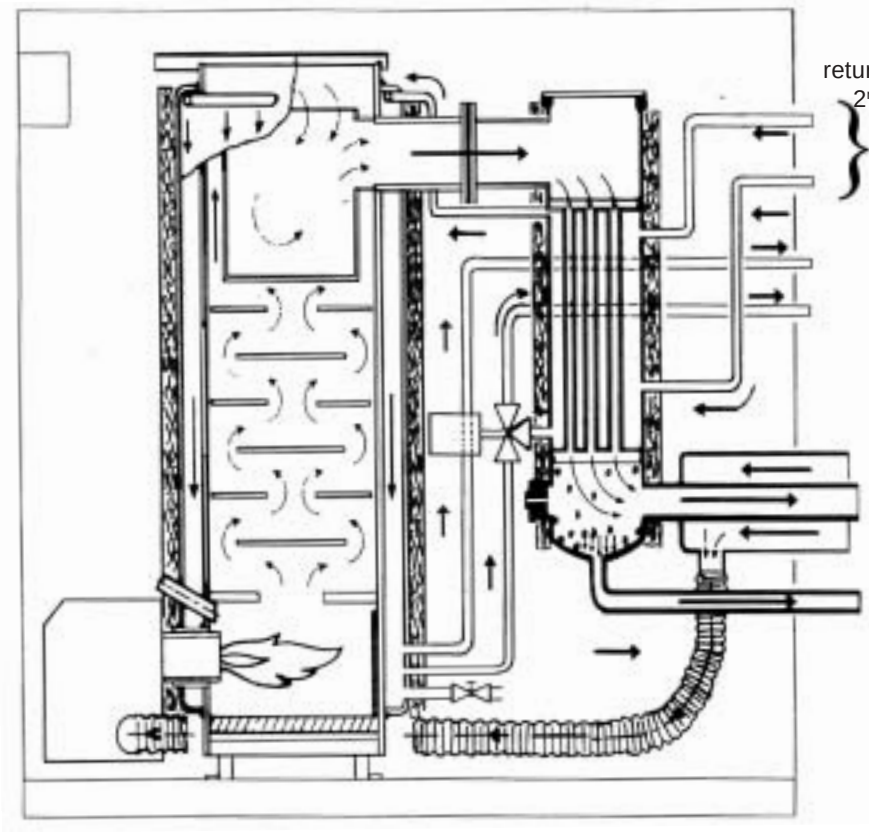
Rear View



Front View

9) *Drain Cock*
10) *Burner Air Inlet Pipe*
11) *Oil Burner*
12) *Safety Light and Reset Button*
13) *Sight Glass*
14) *Heating System Shell*
15) *Pockets for Water Overheating Safety and Thermostat Bulbs Thermostat*
16) *Heating Output Sensor*
17) *Bleed Connection*
18) *First Circuit Heating Output*
19) *Second Circuit heating output*
20) *Combustion Products Flue*
21) *First Circuit Heating Return*
22) *Second Circuit Heating Return*
23) *Well for Combustion Product Overheating Thermostat Bulb*
24) *Protection Plate for Electrical Connections Box*
25) *Circulating pump*
26) *Expansion vessel*

3 - HEATING SYSTEM OPERATION



Combustion air is drawn into the oil burner by the burner fan through the air intake hose connected to the coaxial flue/combustion air intake/ exhaust separator. Heated air from combustion of the oil burner cools as it passes through the heating system heat exchanger, then the secondary heat exchanger condenser. Cooled flue products exit the unit through the center of the flue/combustion air separator tube assembly. Condensate from the flue products is drained from the bottom of the condenser into the condensate drain tube, exiting the unit through the condensate drain system.

Water is circulated through the heating system heat exchanger and condenser circuits where it is heated by the combustion of the oil burner. Two independent water-heating circuits can be connected to the unit:

- The first circuit passes through a three way mixing valve incorporated into the heating system. This valve can either be used manually as supplied or driven by a motorized controller (option).
- The second circuit can supply another heating circuit and/or a domestic hot water indirect storage tank such as BS DHW tanks.

4 - PRODUCT STANDARD RATINGS

Ratings for Model FCX are provided in the following table:

Performance Parameter	Units	Product Rating
Rated Input	BTUH	81,250
Rated Output	BTUH	76,000
Combustion Chamber Length	Inches	8.98
Combustion Chamber Diameter	Inches	11.5
Combustion Chamber Volume	Cu. Inches	915
Combustion Prod. Circuit Volume	Cu. Inches	3051
Flue Pressure Drop	Inches H2O	0.10
Max Heating Service Pressure	Psig	43.5
Max Heating circuit water temp	Deg. F	176
Water Overheating Safety Thermostat Setting	Deg. F	230
Combustion Prod. Overheating Safety Thermostat Setting	Deg. F	248
Heating Circuit Water Capacity	Gallons	4.23
Primary Water Flow Rate (60/80 deg. C)	Gal/hr	254
Water Pressure Drop (at nominal flow rate)	MCE	1.4
Power Absorbed (with burner, without circulator)	KW	0.2
Packaged Weight	Lb.	267

Ratings are for the heating system when connected to standard option coaxial flue system components.

Electrical Power Supply	115 volts, single phase, 60 Hz
Full Load Current	2.0 Amps FLA
Max Fuse/ Circuit Breaker Size	15 Amps

5 - DIAMETER OF PIPE CONNECTIONS

Connection	Diameter	Units
Combustion Products	3.15 / 4.92	Inch
Water Heating Supply/Return	1	Inch
Domestic Hot Water or Second Heating Circuit	1	Inch
Condensate Drain	1 -1/2	Inch
Heating Water Drain	1/2	Inch
Air Bleed	3/8	Inch
Safety Pressure Relief Valve	3/4	inch

II. INSTALLATION

1 - OPENING THE UNIT

To open Model FCX to access for installation, and/or service, follow these steps :

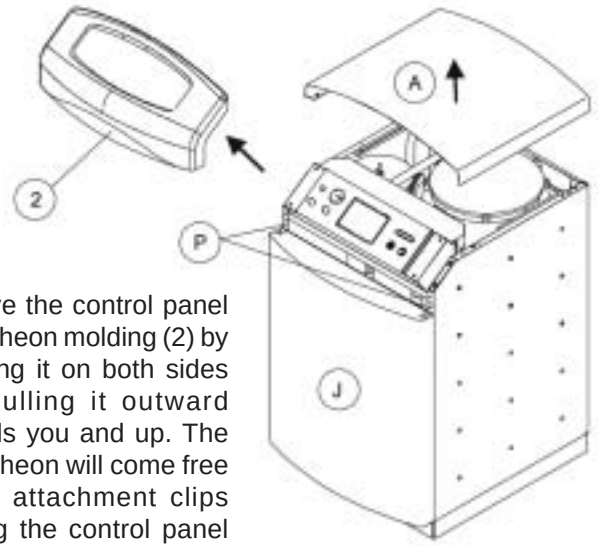


Fig. 4

- Remove the control panel escutcheon molding (2) by grasping it on both sides and pulling it outward towards you and up. The escutcheon will come free of the attachment clips leaving the control panel exposed.
- Remove the top cover of the unit (A) by lifting the cover at the front and rear to free the attachment clips, and then simply lift the cover straight up and off.
- Remove the front panel attachment screws (P), then pull the front panel (J) outward towards you at the top to free it from the attachment clips. Lift the panel up to free it from the lower attachment pins, and simply lift the panel off.

2 - LOCATION OF THE UNIT

Model FCX is a free standing (floor mounted) appliance suitable for installation on combustible flooring. It is approved for installation with zero clearance to combustible walls, ceiling, doors, etc from the cabinet. Standard option coaxial flue components are suitable for installation with zero clearance to combustible materials.

These are operating clearances and it is recommended that additional clearances be considered:

- Sufficient clearance should be provided in back of the unit to facilitate installation and maintenance of water, electrical, flue and condensate drain connections and components.
- Sufficient clearance over the top of the unit should be provided to allow the top to be removed for service.
- Sufficient clearance from the front of the unit should also be provided to facilitate adjustments and service.

There is no need for additional clearance to either side of the unit since there is no access to the unit from either side.

Alternative access measures such as doors, removable wall panels, etc. may be provided if desired.

Choosing the location should also take into account the total flue length to the outdoors (See Flue Connection and Routing). In addition, the choice of location should consider the location of utilities such as electrical supply and sewer access for condensate drainage. Location and routing of water lines is, of course, a significant part of the choice. While Model FCX can be installed in an enclosure such as a closet, ventilation or other means must be provided so that the enclosure temperature does not exceed 113 deg. F (45 deg. C).

3 - FLUE CONNECTIONS AND ROUTING

Connection of the coaxial flue/combustion air piping system is in the back of the unit to the separator tube assembly. The combustion products are vented from the heating system and condenser through the center of the coaxial tube, while the combustion air is supplied through the outside ring of the coaxial tube. Since the FCX is a condensing heating system, flue products exiting the unit are relatively low temperature, typically from 120 - 212 ° F (49 - 100 ° C), and saturated with humidity. Consequently, an airtight, corrosion resistant flue system must be provided.

Various standard option flue piping components and packages with which to create the flue system are available.

0.98 m Straight Horizontal Flue Kit

Fig. 5

Reference No	Length
MPI Part 2201 (N40.28399)	38.6” (980 mm)

Useful length after assy. - 34.6” (0.88 m)

3 m Angled Horizontal Flue Kit

Fig. 6

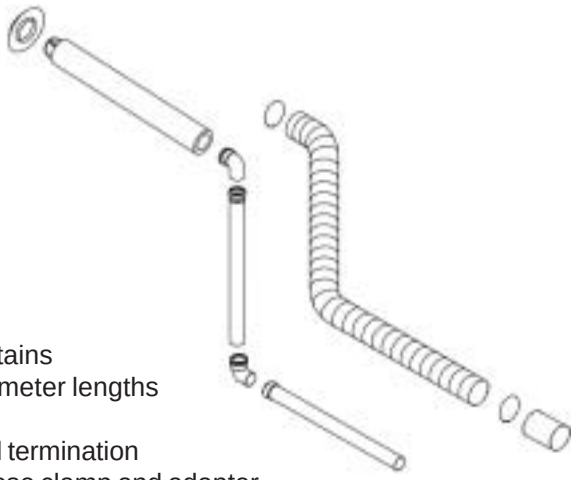


Fig. 6 Contains
2 80 mm/1 meter lengths
2 elbows
1 horizontal termination
1 flexible hose clamp and adapter.
NOTE: If the vertical length is more then 1 meter a 45 degree concentric elbow, #2204 or 1/2 meter extension, #2202, can be used coming out the back of the unit. This kit must be properly supported.

Reference No MPI Part 2209 (V72.28414)

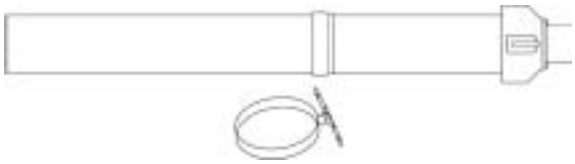
3 m angled horizontal balanced flue -straight

Fig. 7

Reference only

PP/PVC Concentric Vertical Terminal - For Flat or Sloping Roof

Fig. 8



Reference No	Color	Length	I.D.	O.D.
MPI Part 2206	Black	51.9” (1320mm)	3.15” (80mm)	4.92” (125mm)

Useful length under roof flashing - 29.5” (0.75 m)

PP/PVC Concentric Horizontal Extension
- joint fitting -

Fig. 9

Reference No	Length	I.D.	O.D.
MPI Part 2202 (N40.28397)	19.7” (500 mm)	3.15” (80mm)	4.92” (125mm)
MPI Part 2203 (N40.28398)	39.4” (1000 mm)	3.15” (80mm)	4.92” (125mm)

Useful length after assy. - 17.7” (0.45 m) or 37.4” (0.95 m)

Roof Flange with Adaptable Coupling

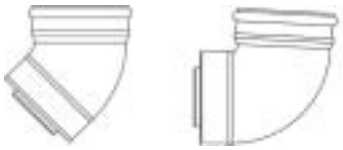
Fig. 10

Reference No	Slope	Covering type	Color
9031	25 - 45 deg	Tile/Shingle	Red
9032	25 - 45 deg	Slate - Shingle	Black

PP/PVC Concentric Elbow

- joint fitting -

Fig. 11



45° bend 90° bend

Reference No	Bend	I.D.	O.D.
MPI Part 2204 (N40.28395)	45 deg	3.15" (80mm)	4.92" (125mm)
MPI Part 2205 (N40.28396)	90 deg	3.15" (80mm)	4.92" (125mm)

Fastening collar (option)

Fig. 12

Reference No	Number	Ø mm
MPI Part 2208 (B00.29727)	3	125

Collars are essential to bear the weight of the vertical extensions so that the heating system does not bear the weight, as well as horizontal runs preventing sagging and pooling of condensate.

Polypropylene Roof Plate

Fig. 13

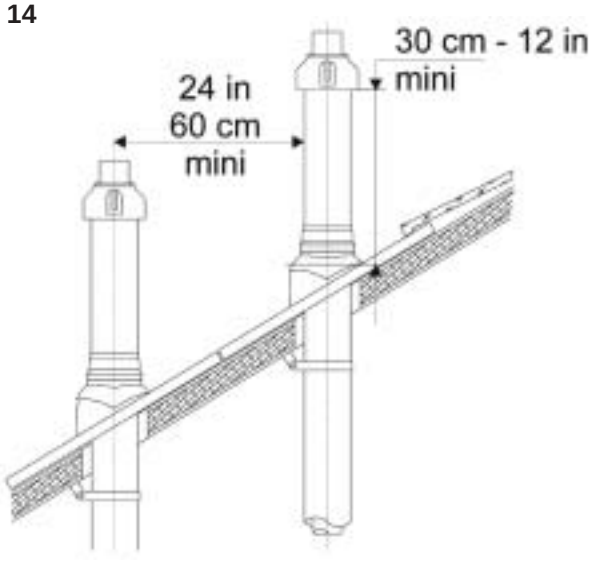
Reference No	Color
MPI Part 2207 (A90.12172)	Black

TYPICAL INSTALLATION EXAMPLES:

The flue/combustion air system piping may be either horizontal or vertical or a combination of both, observing the following:

- The maximum unrestricted horizontal or vertical flue length shall not be more than 16.4 ft (5 m), if using the HeatWise burner.
- For each 90-degree elbow used in the flue system, subtract 3.28 ft (1m) from the total allowable length.
- For each 45-degree elbow used in the flue systems, subtract 1.64 ft (0.5m) from the total allowable length.
- Horizontal runs of the flue system must pitch back 3/4 inch per yard (2 cm per m) of length towards the heating system to ensure proper flue products condensate drainage.
- Termination of a horizontal flue system shall not be less than 2 ft above grade or 1 ft above average snow level as shown in fig. 15 and 16 or as dictated by local codes.
- Do not place the flue terminal less than 6.56 ft. (2 m) from a ventilation hole or opening in a building. NOTE: This is an important concideration if unit is used year round (domestic hot water production) where windows may be open.
- Termination of a vertical flue must provide at least 12 inches (30cm) above the roof jack to the combustion air intake collar.
- If there are two units in the installation with vertical flue systems, the termination of the systems must be separated by 24 inches (60cm).

Fig. 14



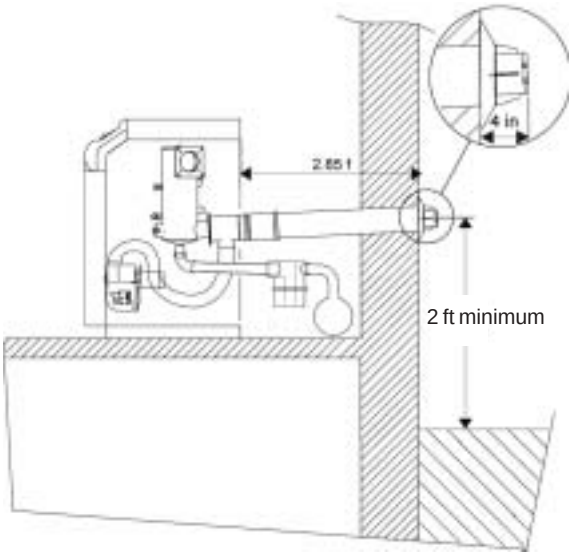
All flue-piping components must be assembled and supported to provide an airtight flue/ combustion air system.

Application of liquid soap over the flue pipes to be joined will aid in assembly of the parts.

Typical installation examples appear in the illustration that follow.

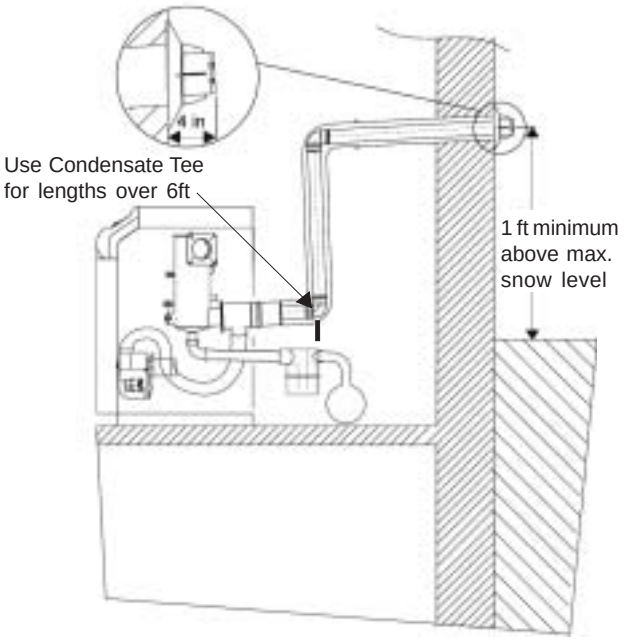
Straight Balanced Flue Configuration

Fig. 15



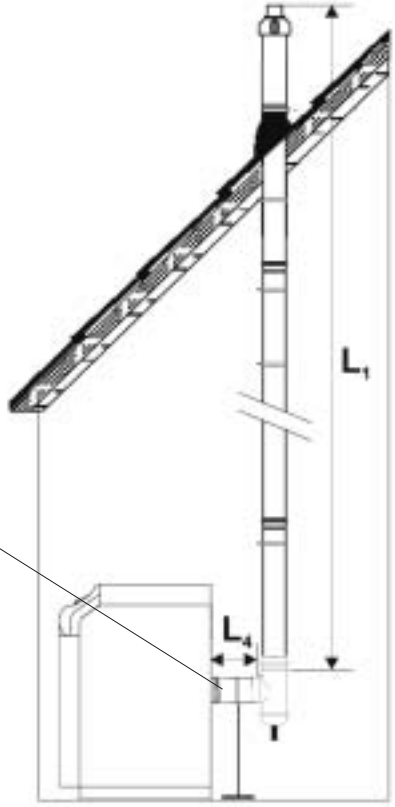
Option: Straight Horizontal Flue Kit

Angled Balanced Flue Configuration
Fig. 16



Option: Angled Horizontal Flue Kit

Fig. 17



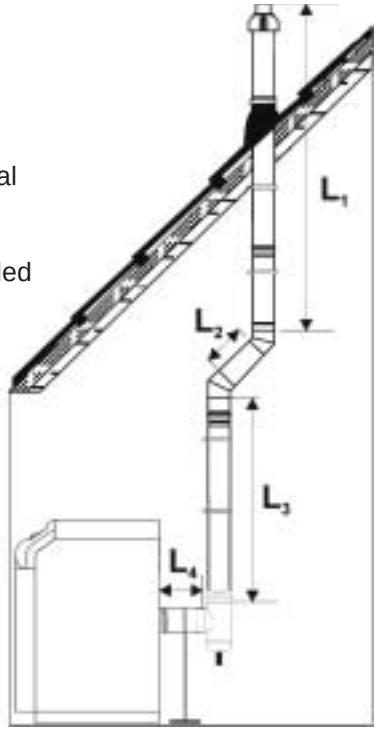
To provide clearance around water connections a 1/2 meter concentric extension can be used

Options:
Condensate Tee
Concentric extensions
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate
Adjustable supports as needed

max L = L1 + 3.28 ft (1m) ≤ 16.4 ft (5m)

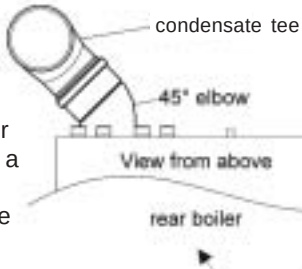
Fig. 18

Options:
Condensate Tee
3 Concentric extensions
2 45 deg concentric elbows
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate
Adjustable supports as needed



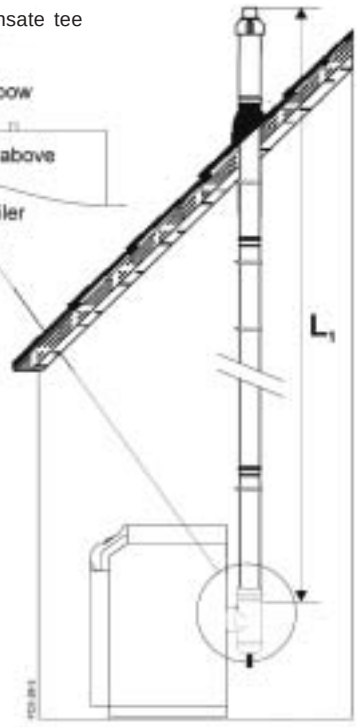
max L = L1 + 1.64 ft (0.5m) + L2 + 1.64 ft (0.5m) + L3 + 3.28 ft (1m) ≤ 16.4 ft (5m)

Fig. 19



To provide clearance around water connections a 45 degree elbow can be used.

IMPORTANT: Total lengths longer then 6 ft (2 meters) should use a concentric condensate Tee, #2255, instead of the concentric 90° elbow to eliminate condensate before draining back to the unit. Condensate tee must drain properly. It can be tied into condensate drain of the unit.



Options:
1 45 deg concentric elbow
Condensate Tee
Concentric extensions
1 concentric vertical terminal
1 sleeve tile roof flange
1 roof plate

max L = L1 + 1.64 ft (0.5 m) + 3.28 ft (1m) ≤ 16.4 ft (5m)

Note: Use fastening collars as needed. Support leg can consist of a fastening collar attached to a support such as a 2X6 joist.

4 - ALTERNATIVE FLUE CONNECTIONS

All combustion appliances consume a quantity of air proportional to their capacity. **If unit is installed using inside make up air, ventilation louvers must be installed in confined areas according to code.** To avoid corrosion, the combustion air must not contain any harmful agents. Halogenated hydrocarbons, containing combinations of chlorine or fluorine that are found in solvents, paints, glues, propellants, household cleaning products, etc.

The FCX heating system is a condensing heating system, which means that the combustion products from the appliance are discharged at low temperature (120° to 212°F) and saturated with humidity. Consequently, an airtight, corrosion-resistant flue system must be provided. It is possible to use an existing flue as long as it is lined. The lining must be inserted so that it does not retain any condensate and so that any condensates are transferred to a drain located at the foot of the flue or directly back to the heating system condensate trap. The material for the lining must be chosen specifically for use with a condensing heating system. Suitable materials certified for use in such combustion product systems are 904 L stainless steel, PPS polypropylene, and PVDF. Specialized companies market these systems and indicate the tubing assembly procedures to be applied.

Some flue components available from Monitor Products are as follows:

Flue Connection Adapter -

Adapter is a 4.33 to 3.15 inch (110 to 80 mm) off center reducer.

Fig. 22

Reference No 9103

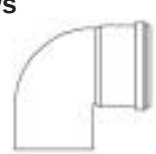
Rigid Polypropylene Tubes

Fig. 23

Reference No	Length inch (m)	Ø inch (mm)
2256	39.37 (1)	3.15 (80)
2257	78.7 (2)	3.15 (80)
9049	39.37 (1)	4.33 (110)
9102	78.7 (2)	4.33 (110)

Polypropylene Elbows

Fig. 24



Reference No	Type Elbow	Ø inch (mm)
2259	90°	3.15 (80)
9048	90°	4.33 (110)

Leaf Guard

Fig. 25

Reference No

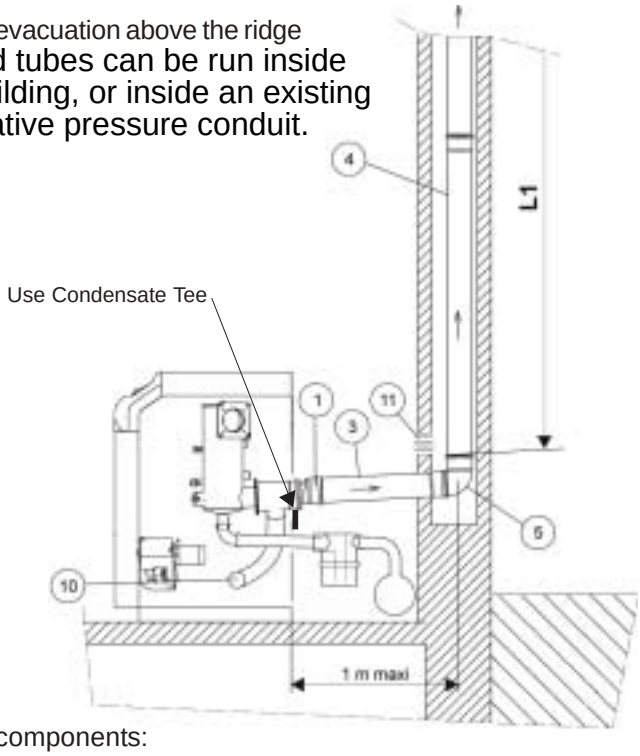
2210 4.33” (110)

Should be used on the end of 110 mm piping run

Fig. 27

Roof evacuation above the ridge

Rigid tubes can be run inside a building, or inside an existing negative pressure conduit.



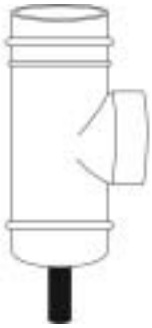
Flue components:
Flue connection kit with off-center reducer (item 1)
4.33 in (110mm) polypropylene tube, 1m long (item 3),
4.33 in (110mm) polypropylene tube, 2m long (item 4),
4.33 in (110mm) 90° polypropylene elbow, (item 5)
L1 ≤ 32.8 ft (10m)

Note:

- With this arrangement, the burner air inlet hose (10) is disconnected from the burner. The burner draws air directly into the unit from the premises in which the heating system is installed. Combustion air must be supplied to the premises with a vent (11) or alternative means. Condensate drains down the inside of the flue into the heat exchanger and out the condensate drain tube.
- If you must deflect the flue system, use 45° degree elbows. Use 45 degree elbows instead of 90° to lessen flue restrictions.

PPtl/PVC Condensate Tee-Joint
- joint fitting -

Fig. 28



Reference No	Length	I.D.	O.D.
2255	10”	3.15”	4.92”

Length does not include drain spicket
Useful length after assy. 2”

PPtl/PVC Parallel Concentric Adapter (Male/Top)
- joint fitting -

Fig. 29

Reference No	Length	I.D.	O.D.
2253	3.5”	3.15”	4.92”

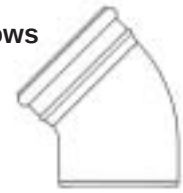
PPtl/PVC Parallel Concentric Adapter (Female/Bottom)
- joint fitting -

Fig. 30

Reference No	Length	I.D.	O.D.
2254	7”	3.15”	4.92”

45 degree Polypropylene Elbows

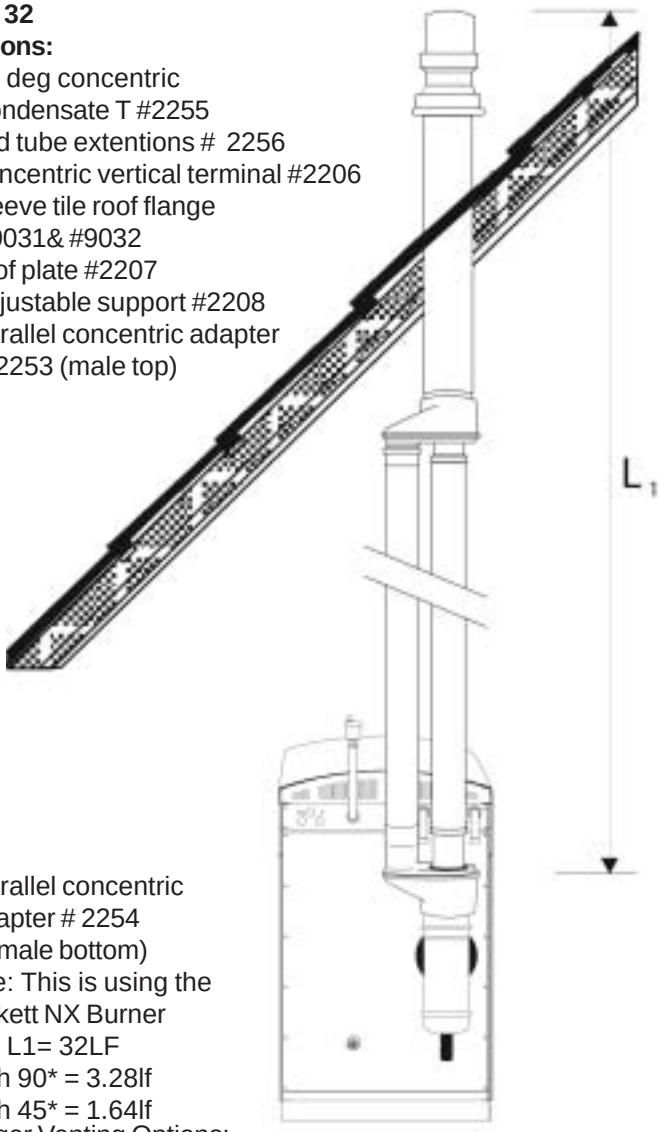
Fig. 31



Reference No	Type Elbow	Diameter
2258	45 degree	3.15”/80mm
2260	45 degree	4.33”/110mm

Typical Installation examples

Fig. 32
Options:
1 90 deg concentric
condensate T #2255
Rigid tube extentions # 2256
1 concentric vertical terminal #2206
1 sleeve tile roof flange
#9031& #9032
1 roof plate #2207
1 adjustable support #2208
1 parallel concentric adapter
2253 (male top)



1 parallel concentric
adapter # 2254
(female bottom)
Note: This is using the
Beckett NX Burner
Max L1= 32LF
Each 90* = 3.28lf
Each 45* = 1.64lf

Longer Venting Options:
Longer exhaust lengths can be achieved by using a Beckett NX burner specifically modified and set up for use with the FCX. When using the Beckett NX burner the maximum unrestricted horizontal or vertical flue length shall be no more then 36 feet if using an 80mm parallel piping system with PPTL/PVC parallel concentric adapters on each end, or no more then 30 feet if using concentric PPTL/PVC end to end. The subtraction of 3.28 feet for 90 degree elbows and 1.6 feet for 45 degree elbows still applies and must be taken into account when figuring what the overall length is. It is recommended that the Heatwise burner be used on overall lengths of less then 16.4 feet and the Beckett be used on lengths of 15 to a maximum of 36 feet.

The Beckett NX burner adapted for use on the FCX must have the following specifications:
The oil line heater is standard with the burner.
The oil pressure is set to (150-155) PSI.
The oil nozzle used is a Danfoss .5-60 degree-AH.

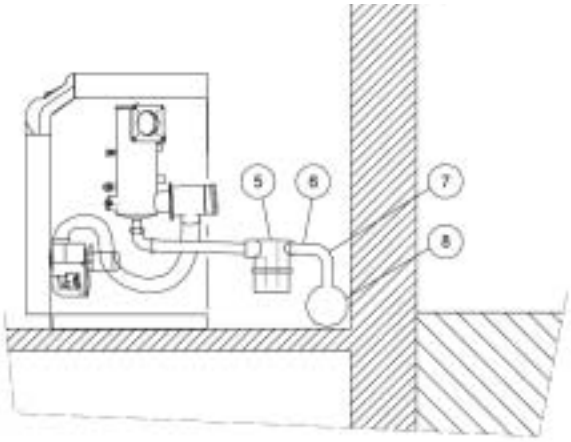
NOTE: Do not use any larger size or supply nozzle with higher pressure

Combustion readings should be CO 11 - 12.5, smoke 0 - .5

5 - CONDENSATE DRAIN CONNECTION

Connection of the condensate drain piping system is to the condensate drain tube in the rear of the unit beneath the flue/ combustion air separator tube assembly. The condensate drain tube provided in the unit is 1-19/32 inches (40 mm) outside diameter over which standard 1-1/2 inch trade size schedule 40 PVC pipe can be connected to begin the rest of the drain system. A trap must be provided to prevent leakage of combustion products into the drain. The drain system must pitch downward towards the sewer.
Note: The condensate will not likely require any specific water treatment because of condensate dilution by normal wastewater use. If, however, local regulations require wastewater to have a neutral pH condensate treatment tank can be installed between the trap and the sewer. PH level must be neutralized before entering a septic tank or cesspool.

Fig. 33



NOTE: Make the trap accessible and removable for cleaning and do not down size the condensate drain tube until after the trap, if necessary. If using a condensate pump choose a pump that can hold up to the corrosive effects of the condensate.

6 - WATER CIRCUIT CONNECTIONS

Water circuit connections are made in the back of the unit utilizing the four 1" male pipe thread couplings provided or using other adapters provided. The FCX can be connected to various comfort heating water systems as well as to a domestic hot water heating system if desired, observing that:

- Water circulating pumps provided in the various circuits must be large enough for each circuit including the pressure drop of the heating system/condenser in the unit. For optimum sound level and power consumption, set the circulator to the speed that is appropriate for the installation flow rate and pressure drop.
- Isolation valves may be used in the various circuits to facilitate heating system maintenance without having to completely drain each circuit. NEVER place an isolation valve between a pressure relief device and a water tank.
- The water pressure gauge (not supplied) has to be fitted outside the unit.

The FCX comes equipped with the following standard equipment:
1) 8L expansion Tank (Approx. 2.11 US Gallon with acceptance value of approx. 0.9 gallons) Please refer to expansion tank manufacturers tables to determine tanks that meet your systems requirements. Some radiant systems may require special tanks to meet tubing oxygen requirements.
2) Grundfos UPS1542 Circulator. (see Fig. 35 on page 11 for pump capacities.) Additional pumps or a primary secondary system may need to be set up to meet individual system requirements
3) Safety relief valve. Must be piped away from heating system as per code using rigid pipe that is the same diameter of the relief valve outlet approved for the temperature of the system. Discharge pipe must not cause a hazard or a potential cause of damage to equipmernt.

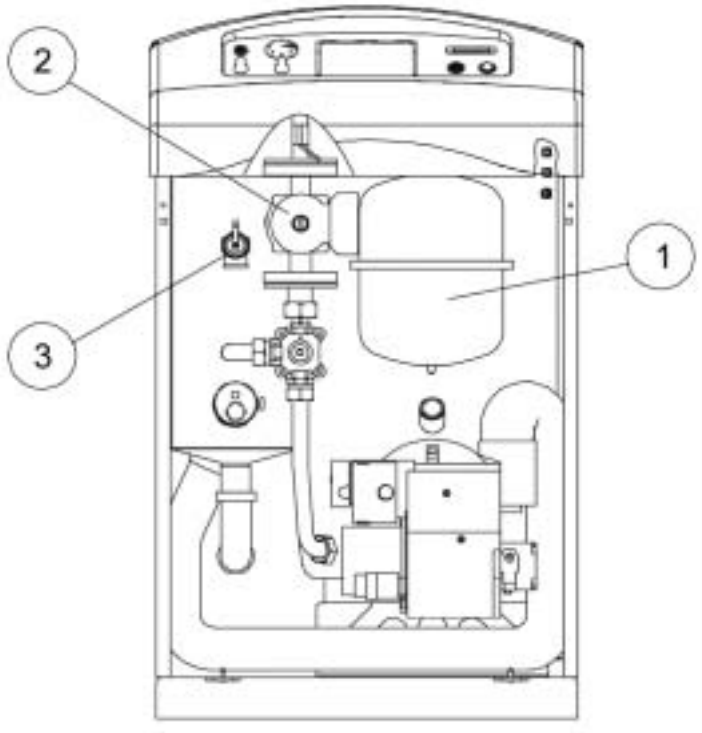
CAUTION:

If the pressure relief valve is not piped down and it opens, damage can occur to the burner.

Fig. 34

1. expansion tank
2. circulating pump
3. safety pressure relief valve

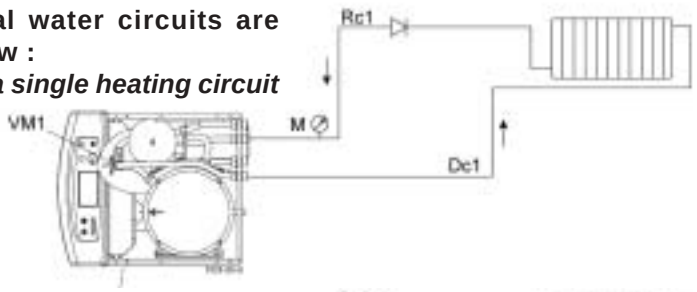
Note: Installed expansion tank is good for up to 25 gallons of system water. An additional expansion tank is required for more than 25 gallons. Size accordingly.



Various typical water circuits are illustrated below :

Connection to a single heating circuit

Fig. 35

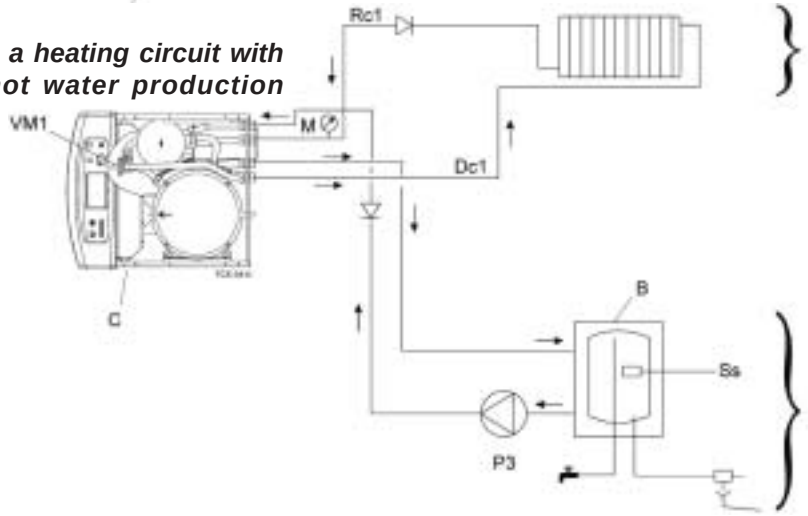


C1

C Heating system
M Pressure gauge
C1 = Radiator circuit, Baseboards, Radiant Panels or Fancoils
VM1 1st circuit mixer valve
Dc1 1st circuit heating outlet
Rc1 1st circuit heating return

Connection to a heating circuit with a domestic hot water production system

Fig. 36



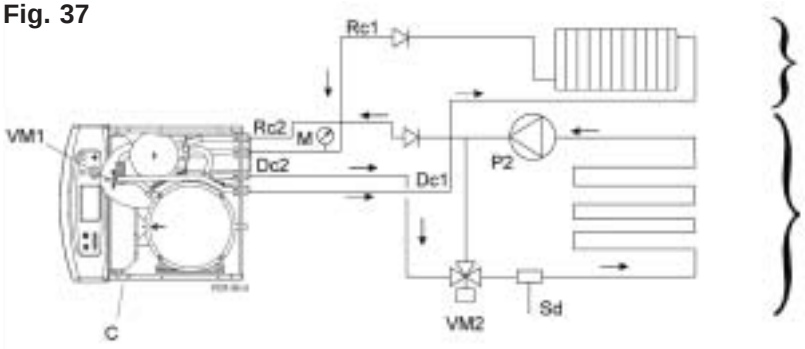
C1

C Heating system
M Pressure gauge
C1 = Radiator circuit, Baseboards, Radiant Panels or Fancoils
VM1 1st circuit mixer valve
Dc1 1st circuit heating outlet
Rc1 1st circuit heating return

C3 = Domestic hot water preparation circuit
P3 Domestic hot water pump
C3 B Domestic hot water production system
Ss Domestic hot water sensor

Connection to a double heating circuit

Fig. 37



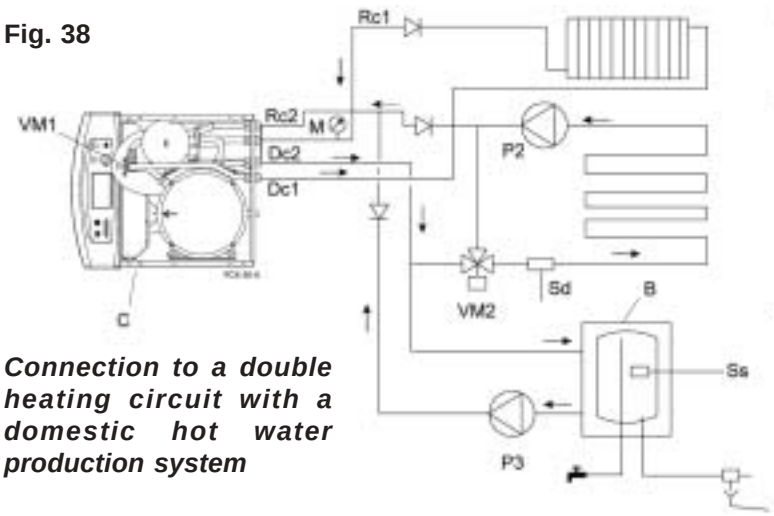
C1
C2

C Heating system
M Pressure gauge
Low Temp
C1 = Radiator circuit
VM1 1st circuit mixer valve
Dc1 1st circuit heating output
Rc1 1st circuit heating return

C2 = Underfloor heating circuit
P2 2nd circuit heating circulator
VM2 2nd circuit mixer valve
Dc2 2nd circuit heating output
Rc2 2nd circuit heating return
Sd Heating output sensor

Note: If the radiator circuit is high temperature baseboard then the connections at the heating system should be reversed with the baseboard loop using the DC2 circuit and circulator and the underfloor loop using the DC1 circuit which eliminates the need for VM2 since DC1 has one built in. This applies to figs 37 and 38.

Fig. 38



Connection to a double heating circuit with a domestic hot water production system

C1
C2
C3

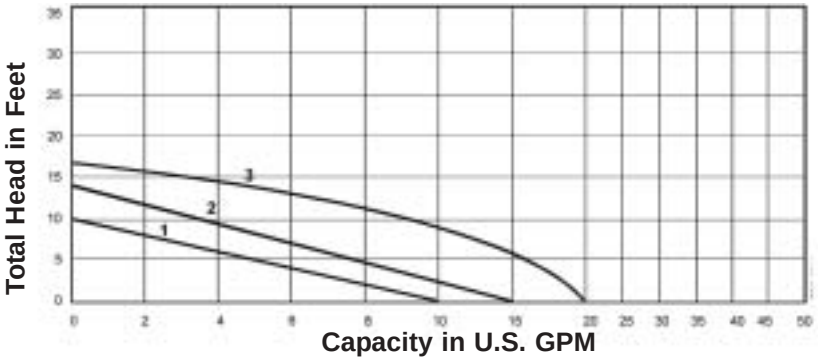
C Heating system
M Pressure gauge
C1 = Radiator circuit
VM1 1st circuit mixer valve
Dc1 1st circuit heating output
Rc1 1st circuit heating return

C2 = Underfloor heating circuit
P2 2nd circuit heating circulator
VM2 2nd circuit mixer valve
Dc2 2nd circuit heating output
Rc2 2nd circuit heating return
Sd Heating output sensor

C3 = Domestic hot water production circuit
P3 Domestic hot water pump
B Domestic hot water production system
Ss Domestic hot water sensor

6.1 - CIRCULATING PUMP CHARACTERISTICS

Fig. 39



HP range 1/25, 1/12, 1/6
Fluid temp 230°F Maximum
50°F Minimum
Flow Range 10-46 GPM

7 - ELECTRICAL CONNECTIONS

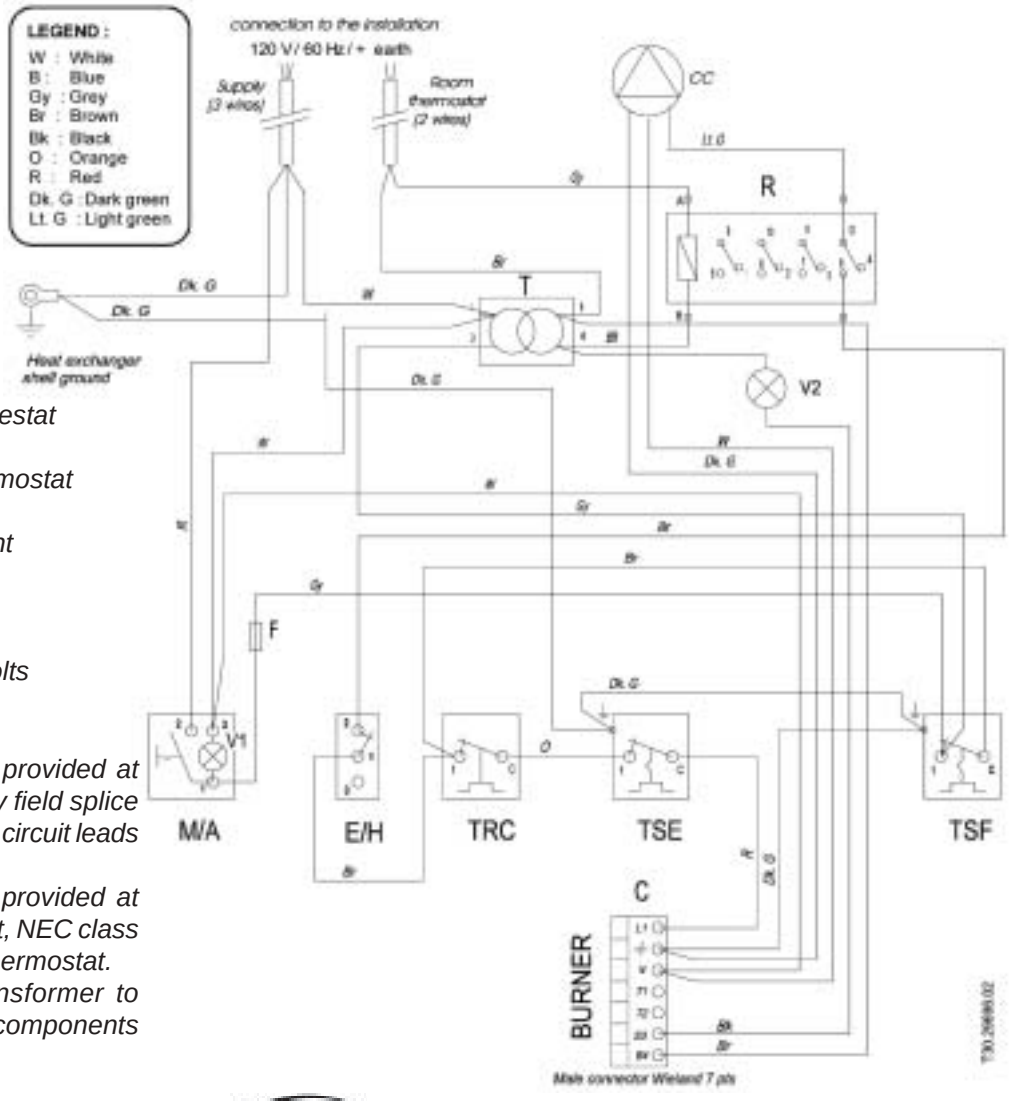
WARNING - ELECTRICAL SHOCK HAZARD! DISCONNECT THE POWER SUPPLY BEFORE ATTEMPTING ELECTRICAL INSTALLATION OF THE UNIT.

Electrical power and control connections are made to pigtail leads that exit through holes in the right rear of the unit (facing the front of the unit).

The power connections must be made in a Listed junction box that is not provided with the unit. All wiring should conform to the National Electrical Code and any applicable local codes and standards. To minimize the likelihood of a heating system shutdown caused by an unrelated electrical circuit fault, the unit and any related electrical components should be connected to a separate branch circuit specifically dedicated for that purpose.

The control circuit connections can be in-air splices made to pigtail leads provided. Control circuit connections are NEC Class 2, intended for connection to a typical room thermostat.

Fig. 40



LEGEND

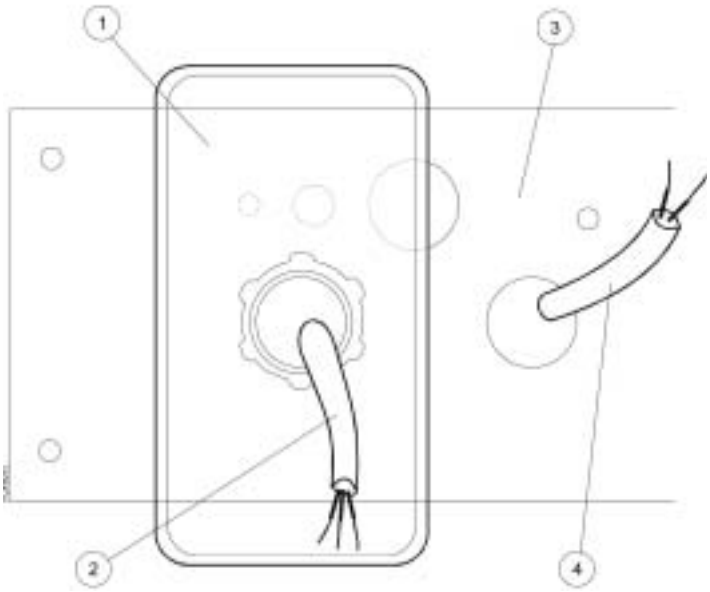
L: Phase
N: Neutral
M/A: On/Off switch
E/H: Summer/Winter switch
TSE: Overheat safety cutout aquestat
TRC: Adjustable thermostat
TSF: Flue gas safety cutout thermostat
V1: On light
V2: Burner safety shutdown light
C: Burner connector
F: Fuse (6,3 A)
R: Relay
T: Main transformer 120/24 volts
CC: Circulating pump

Notes:

A. Electric power leads factory provided at right rear of unit. Permanently field splice 120-1-60 field provided power circuit leads in NEC junction box.
B. Control circuit leads factory provided at right rear of the unit are 24 volt, NEC class 2 for connection to a room thermostat.
C. Do not use the internal transformer to power any external system components such as a zone valve.

UPPER LEFT REAR CORNER OF UNIT (Facing rear of unit)

Fig. 41



1) Junction box
2) Main Power Pigtail Leads
3) Unit Upper Back Panel
4) Control circuit Pigtail Leads

There are three 7/8" holes in the right rear of the unit. Mount a Listed 2 x 4 inch, “HandiBox” type junction box vertically over the lower left hole (facing the rear of the unit) in such manner that the lower right hole is open. When installing the junction box, center the box vertically over the hole by using the center knockout in the box. Install a 1/2-inch trade size cable connector or insulating bushing through the hole in the unit and through the knockout in the box. Secure the box with screws as required.

Route the factory supplied main power pigtail leads through the connector into the junction box from inside the unit and secure the connector clamp on the wires. Install a second cable or conduit connector in another knockout in the box for the power wiring system as required. Connect the power wires and grounding conductors to the pigtail leads in the box using Listed wire connectors and install a cover.

Route the factory supplied control circuit pigtail leads through the lower right hole from inside the unit. Connect the room thermostat wires to the con-circuit pigtail leads using a suitable Class 2 wiring connection method.

8 - FUEL OIL SUPPLY CONNECTIONS

The buner supplied with the unit is connected to the heating system. Lines are terminated with 3/8-inch reverse flare fittings for connection of the supply from the fuel oil tank. When connecting the line, a 10-micron spinon type oil filter must be installed in the oil supply line to minimize burner contamination.

III. START UP AND OPERATION

1 - PRE-START FINAL SYSTEM CHECK

Before starting normal operation of the heating system, perform the following final installation procedures:

- Leak-check the flue/combustion air system to minimize the likelihood of leakage.
- Leak-check the entire water system, repairing any leaks that may be found.
- Fill the entire water system with water, treated as desired for the application, including anti-freeze solution if appropriate. Open any shut-off valves in the system
- Fill the condensate drain trap with water
- Leak-check the fuel oil supply system and open any fuel shut-off valves.
- Recheck the power and control circuit connections THEN replace all cabinet access panels
- Energize the electrical power circuit to the unit.

2 - START-UP AND OPERATION

After completing the pre-start final system checks, the system can be started and run through start-up checks and adjustments as required.

1) Start/Stop Switch

2) Summer/Winter Switch
Circulator control inside the heating system

3) Heating System Temperature Control Thermostat
Heating System Temperature adjusted between 140 - 176 deg. F (60 - 80C)

4) Water Outlet Temperature Thermometer (Circuit 1)

5) Water Overheating Safety Thermostat
Burner Cutout

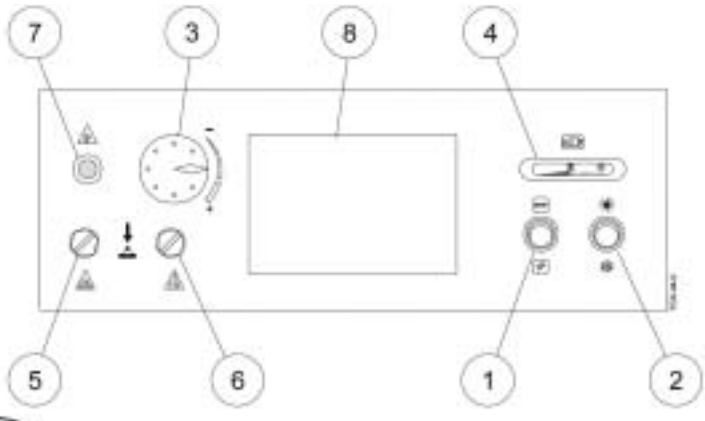
6) Combustion Product Overheating Safety Thermostat
Heating System Shutdown

7) Burner Safety Device Light

8) Slot for Additional Control

Note: overheat thermostats may not physically pop up if tripped. Press the red center with a pointy object such as a pen and listen for an audible click.

Fig. 42



To start the heating system, first make sure the room thermostat is set at a high enough temperature to be closed so that any external water circulating pumps are running. Turn the heating system On-off switch to the “ON” position, and set the Heating System Temperature Control thermostat to its maximum temperature setting.

Turn the Summer-winter switch to “WINTER”. This will start the internal circulating pump. After the start time delay set on the oil burner (for the oil heater) has expired, the burner will start. Reduce the Heating System Temperature Control thermostat setting to make sure the heating system stops properly when controlled by that thermostat. Increase the room temperature thermostat setting to make sure that the circulating pump(s) stop properly.

3 - ADJUSTING THE OIL BURNER

While the oil burner leaves the factory set at the recommended settings, safe operation requires that the burner be checked and adjusted by a qualified, licensed if required, oil service technician using properly calibrated combustion test equipment, vacuum and pressure gages. Run the unit long enough at the burner maximum firing rate to make sure the burner has reached a stable maximum operating temperature. THEN, check the burner and adjust as follows:

Check to determine that the smoke spot number does not exceed 0.5 with a Bacharach or equipment tester control. Adjust the burner as required to be below this maximum.

Check to determine that the CO2 rate is from 11.5 - 13 percent and that there is no CO production. Adjust the burner as required to achieve this operating characteristic.

Measure the temperature of the flue gas exiting the unit to determine that it does not exceed 250 degrees F (120 C).

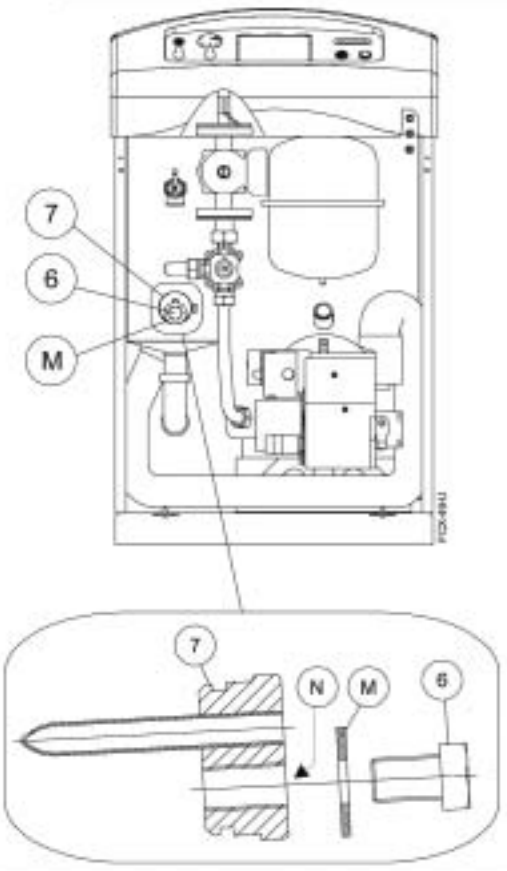
Combustion inspection can be carried out on the unit through the hole (item N) provided in the inspection port (item 7). Be sure to replace the washer (item M) and the test point screw (item 6) properly after inspection.

Factory Settings for the Burner

Burner		**PIONEER - 1**
Oil pump pressure	psig	165-170
Nozzle		0.50 80° AS
Firing Head Adjustment		1.75
Air shutter Adjustment		6-8

For more detailed burner instructions refer to the Heatwise or the Beckett NX burner manual

Fig. **43**



4 - CHECKING THE SAFETY DEVICES

At the time of start-up, check the safety and control devices as follows:

Thermostats:

- Check to see that the thermostat bulbs are correctly positioned in their housings. This is essential to provide temperature sensing to facilitate burner shutdown in the event of overheating,

Flame monitoring:

- Check to make sure that the burner shuts down properly upon the deactivation or disconnection of the flame monitoring device or interruption of the flow of fuel,

Safety Pressure Relief valve:

- Check the safety pressure relief valve in the heating circuit for proper operation.

IV. MAINTENANCE

It is recommend that the heating system and flue/combustion air system be inspected and maintained annually by a qualified technician.

DISCONNECT ALL ELECTRICAL CIRCUITS BEFORE SERVICING THE UNIT CLOSE ANY ISOLATION VALVES THAT MAY BE IN THE WATER SYSTEM SHUT OFF THE FUEL OIL SUPPLY IF SERVICING THE BURNER

To gain access to the inside of the unit, first remove the control panel cover by grasping it on both sides and pulling directly outward towards you and up. Remove any front panel screw(s) and remove the front panel by pulling the top out towards you and then lifting up to free the bottom from the mounting pins. Remove the top cover by simply pulling it up. Remove the electrical terminal block protection plate by removing the screws in the rear and lifting. Remove the control panel cover screws and remove the control panel cover. The water can be bled from the unit by opening the drain-cock on the base of the heating system shell using the valve caps as the valve handle.

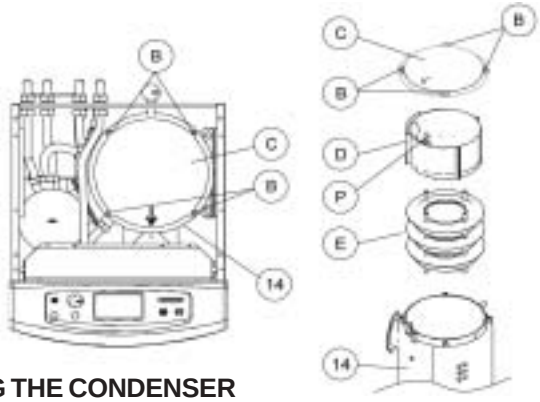
1 - CLEANING THE HEATING SYSTEM SHELL

- Remove the screws (B) from the cast-iron heating system shell cover (C)
- Remove the flue outlet baffle (D)

Note: If vacuuming be careful not to damage insulator, check for deterrieration and replace if needed

- Remove the combustion baffles (E) clean, inspect and replace if deteriorated
- Clean the inner walls of the heating system shell, remove any debrie that may have fallen to the bottom of the chamber
- Reassemble all the parts the way they were removed, positioning the flue outlet (D) with its centering screw (P) towards the front of the heating system, then positioning the heating system shell cover (C) arrow marker opposite the centering screw (P)
- Replace the screws (B) in the heating system shell cover.

Fig. 44

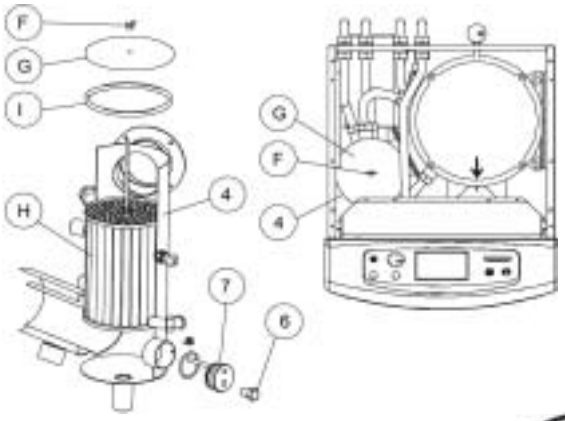


2 - CLEANING THE CONDENSER

- Remove the wing nut (F) from the condenser top cover (G) and remove the cover
- Remove the condenser access plug (7)
- Clean the condenser tubes (H) using a bottle brush or similar tool
- Pour tap water through the condenser tubs to ensure combustion products can flow freely
- Visually inspect vent house tee at condenser outlet for integrity
- Replace the condenser access plug (7) and the top cover (G), making sure that the seal (I) is properly positioned when replacing the cover
- Make sure that the seal (I) on the cover and the access plug is in good condition.
- Inspect and clean the condensate trap(external)

NOTE: If after cleaning the condenser, the temperature of the flue gasses still exceeds 250°F, perform a burner check.

Fig. 41



3 - BURNER MAINTENANCE

Once adjusted properly, regular maintenance of the oil burner is not generally required. A routine examination of the burner should include examination of the burner fan and housing for dirt and the spark electrodes for proper clearances. The nozzle should be replaced after every 1000 gallons of fuel used, due to wear. Replace the fuel filter if necessary. Cleaning and adjustment is always appropriate during periodic inspection. If burner firing rate adjustment is required, follow instructions in “Adjusting the Oil Burner”.

ALWAYS CHECK FOR AND CORRECT ANY FUEL LEAKS

4 - ADDITIONAL COMPONENT MAINTENANCE

Check to see that the safety and regulation devices (safety relief valve, air bleed valve, control box components, etc.) are operating properly. Check that the condensate drain trap is clean. If necessary, remove the bottom of the trap, clean it, replace it and then refill the trap it with water. Also check to see that neither the installation nor the heating system have any water or fuel leaks (leaks may produce a risk for safety and shorten the life-span). If it becomes frequently necessary to add water to maintain pressure in the installation, even though no leaks have been discovered, perform an expansion tank check or if the pressure releif valve drips or pops occasionally.

5 - EXPANSION TANK PRE-INFLATION PRESSURE CHECK

Reduce the pressure in the heating installation by opening the drain cock or the safety valve until the pressure gauge reading is less than 7 - 8 psig (0.5 bar)

Check the pressure in the expansion tank and if necessary bring it back up to pressure. Replace the tank if the membrane is punctured (water present in the inflating valve)

To optimize the efficiency of the expansion tank:

- Adjust its pre-inflation pressure in line with the installation. The pressure must correspond to the static height of the installation (H), the height between the highest point of the installation and the expansion tank, as expressed in psi where 2.41Ft in height = 1 psi
- Adjust the filling pressure of the installation to a value greater than 3 psi (0.2 bar) above the pre-inflation pressure of the tank after totally bleeding any air from the installation.

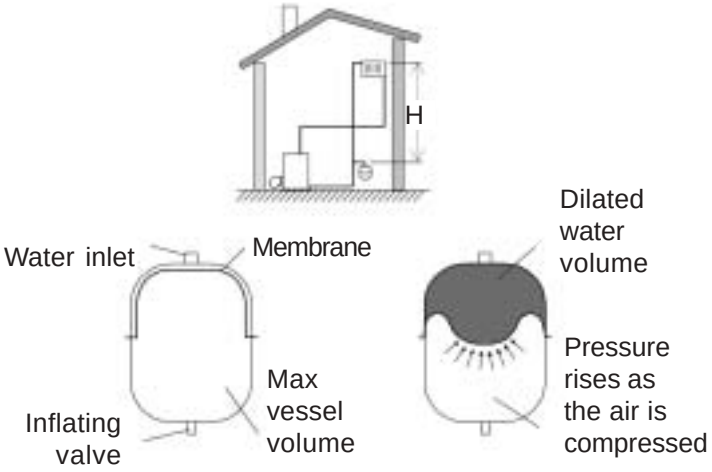


Fig. 42

6 - COMBUSTION PRODUCT FLUE

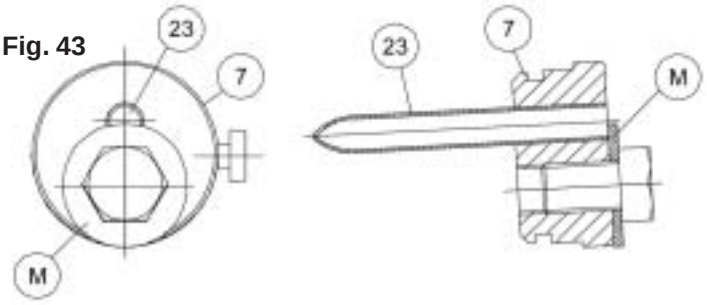
Examine the flue/combustion air system for leaks and obstructions. Leaks can generally be detected by the appearance of condensate stains on the outside of the pipes. Replace any damaged seals if necessary. The flue/combustion air pipe can be cleaned with running water, if necessary, providing that the water flow is not too great to be drained through the condensate drain system. Leave the excess water in the condensate trap when cleaning is completed.

7 - CHANGING A THERMOSTAT OR THE THERMOMETER

Replacement of the thermostats or the thermometer requires removal of the bulb from its location and the control from the control box.

- The bulb for the Heating System Temperature Thermometer is located on the first circuit heating output tube. Remove the bulb from the tube, remove the thermometer mounting screws in the control box and remove the thermometer. Replace the thermometer with another, routing the bulb capillary the same way as the original, replacing the bulb on the tube properly and as securely as possible.
- The bulbs for the Heating System Temperature Control Thermostat and the Water Overheating Safety Thermostat are both located in pockets on the side of the heating system shell. To change either, remove the bulb from the pocket, remove the thermostat mounting screws in the control box and remove the thermostat. Replace the thermostat with another, routing the bulb capillary the same way as the original, replacing the bulb properly into the pocket as far as possible.
- The bulb for the Combustion Product Overheating Thermostat is located in a well provided in the condenser access plug/inspection port. Remove the combustion test point plug and washer from the inspection port to free the thermostat bulb, and remove the bulb from the well. Remove the thermostat mounting screws in the control box and remove the thermostat. Replace the thermostat with another, routing the bulb capillary the same way as the original and replacing the bulb properly into the well as far as possible. Replace the combustion test point plug and washer in the inspection port, securing the bulb in place.

Fig. 43



V. OPERATING FAULTS

During the course of seemingly normal operation, there may be operating faults experienced in the system. Some of the more common faults that may be encountered are:

BURNER FAULT SHUT-DOWN

The burner may shut down for any of several reasons, at which point the burner safety device light (red) on the control panel will be ON and the there will be a green fault indicator light lit on the oil burner. This may be caused by a loss of fuel oil (tank empty?), a fouled oil spray nozzle in the burner, or perhaps a fouled or faulty flame sensor. To attempt a restart after correcting any burner problem and the fuel supply is assured, push the reset button on the burner. The burner should restart after the preset time delay period expires.

OVERHEATING SAFETY THERMOSTAT SHUT-DOWN

Opening of either the Water Overheating Safety Thermostat or the Combustion Product Overheating Thermostat will result in an oil burner shutdown. In either case, the burner safety device light (red) on the control panel WILL REMAIN OFF, and the green fault indicator light on the oil burner will REMAIN OFF. The only way to tell if either device has opened is to check electrically or check the position of the reset button, located under the screw cap over each device.

- The Water Overheating Safety Thermostat may open if the water temperature exceeds 230°F (110°C) in the heating system. This can occur if the water temperature control is near its maximum setting, and or the three way valve is drawing its majority of water out of the secondary condenser. This can be prevented if the water temperature control is turned to a lower temperature, the three way valve is readjusted clockwise or the burner is rewired for a post purge. A faulty water temperature control can also cause a shutdown.

After correcting any fault, either thermostat must be manually reset by removing the screw cap on top and depressing the reset button.

Note: Actuation of the reset button may not be physically visible. If tripped a button will have an audible click when trying to reset.

INLINE OIL HEATER OR THERMOSTAT SHUTDOWN

The heatwise Pioneer Burner is equipped with an inline oil heater, this heats up and closes a thermostat for the burner to get power. If the heater or the thermostat malfunction (one complete unit) it will not allow the burner to start. If the fuel is extremely cold the inline heater may not be able to keep up and may momentarily shut off the burner until the oil gets back to a temperature of 125-130° F.

PHONE (732) 329-0900 • FAX (732) 329-0904

MPI offers technical support to qualified licensed heating contractors during normal business hours. (Monday-Friday 8:30 A.M. to 4:30 P.M. Eastern Time)

To help us serve you properly our technicians will require the following information:

Nozzle manufacturer, G.P.H., angle and pattern.
Pump pressure in PSI Pump vacuum in inchs of Hg
Head Setting and Air Setting
Oil delivery system: 1 pipe or 2 pipe.
Oil Tank: Indoor, outdoor. Above or below pump level.
Smoke reading CO reading in PPM CO 2 reading in %
Flue Outlet Temperature °F
Water Outlet temperature °F Water Return temperature °F
System load: Radiant, high temperature, DHW. Total BTU requirement

VI - MONITOR PRODUCTS, INC. ("MPI") LIMITED WARRANTIES

First year - MPI warrants that its FCX heating systems are free from defects in material and workmanship under normal use and service for 1 year from the date of purchase with an additional period of up to 3 months if the unit is not installed at time of purchase.

First through tenth year - MPI warrants that the primary heat exchanger is free from defects in material and workmanship for 10 years from date of purchase.

Parts covered: All product or parts of the FCX manufactured by or for MPI except as provided for herein.

Parts not covered: The following parts are not covered by this warranty: venting kits, fuses, and all parts subject to physical, chemical or freeze damage. The FCX is designed to be fueled with clean, dry, #2 grade or better, home-heating oil. Use of substandard oil or other fuels will void this warranty. Nozzle failure due to water or contaminants in fuel will not be covered.

This warranty does not cover physical, chemical or freeze damage or use of antifreeze other than that approved by MPI. Water of strong acidic or alkaline composition can damage the heat exchanger assembly and will void this warranty. In addition, the ingestion of chlorine or chlorine contaminating fumes or vapors, fluorine or florine containing fumes or vapors, fumes from animal confinement, fumes from beauty parlors, fumes from muriatic acid or other compounds used for cement cleaning, fumes from mechanical parts' cleaning, fumes from dry-cleaning establishments, fumes from laundry, fumes from manufacturing or industrial activity into the combustion-air to the heating system can damage the heat exchanger assembly and will void this warranty of the heat exchanger assembly.

STANDARD PROVISIONS, TERMS AND CONDITIONS THAT ARE COMMON TO ALL MPI INDIVIDUAL PRODUCT WARRANTIES:

These warranties are subject to the condition that the MPI product(s) must have been installed in accordance with manufacturer's instructions. These warranties extend only to the first retail purchaser of the products and only to a product that has not been moved from its original installation site. These warranties do not apply to commercial applications.

In addition to each product warranty listed, MPI **warranties do not cover**:

1) *Components that are part of the heating system but were not furnished by MPI as part of the heating system.*
2) *The workmanship of any installer of MPI's product(s). In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.*
3) *Any costs for labor for removal and reinstallation of the alleged defective part, the cost of shipping or transportation to MPI and back to the consumer, if necessary, and any other materials necessary to perform the exchange.*
4) *Replacement parts beyond the balance of the original warranty period.*

REMEDY: If within the applicable warranty period, any product(s) or part(s) included in this warranty proves to be defective in material and/or workmanship, then MPI shall repair or replace, at its option, the defective product(s) or part(s) and return it to the consumer.

PROCEDURE FOR OBTAINING PERFORMANCE UNDER THIS WARRANTY: In order to obtain performance under this warranty, the original purchaser must promptly (in no event later than thirty (30) days after discovery of the defect) see to the return of the product(s) or part(s) in question, accompanied by a properly filled out MPI warranty claim form (Available from MPI by mail or phone). Any claim made under this warranty must be accompanied by proof of original purchase date, sales invoice or cancelled check showing the serial number as satisfactory evidence. Any replacements are made subject to validation by MPI of in-warranty coverage. An item to be replaced must be made available in exchange for the replacement.

SOLE REMEDY: The remedy and liability for any breach of warranty, express or implied, set forth herein is the sole and exclusive remedy and the limit of liability for any such breach.

EXCLUSIONS AND IMPLIED WARRANTIES: This warranty does not extend to any defect due to the negligence of others. Failure to install, operate or maintain the product(s) in accordance with the installation, operation and maintenance instructions furnished with each new product, unreasonable use, accidents, acts of god, fire, snow, floods, lightning, alteration, ordinary wear and tear, or the use of unauthorized or non-standard parts.

ALL IMPLIED WARRANTIES, IF ANY, ARISING UNDER LAW IN CONNECTION WITH THE SALES BY MPI OF ANY PRODUCT(S) ARE LIMITED IN EXTENT AND DURATION TO THE DURATION OF THIS WRITTEN WARRANTY. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OTHER THAN AS EXPRESSLY STATED HEREIN. MPI SHALL NOT BE RESPONSIBLE FOR ANY INCIDENTAL, INDIRECT, PUNITIVE, OR CONSEQUENTIAL DAMAGES WHETHER AS A RESULT OF BREACH OF WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE.

Note: Some jurisdictions do not allow: (a) limitations on how long an implied warranty lasts; or (b) the exclusion or limitation of incidental, indirect, punitive or consequential damages, so the above limitations or exclusions may not apply to you.

NO VARIATION OF TERMS: the parties intend that this warranty be the exclusive and final expression of their agreement.

No person has the authority to orally, in writing or in any other way vary the terms, conditions or exclusions of this warranty, or to make any express warranties other than those contained herein.

LEGAL RIGHTS: This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

As part of its policy of continuous product improvement, Monitor Products, Inc. reserves the right to make changes without notice

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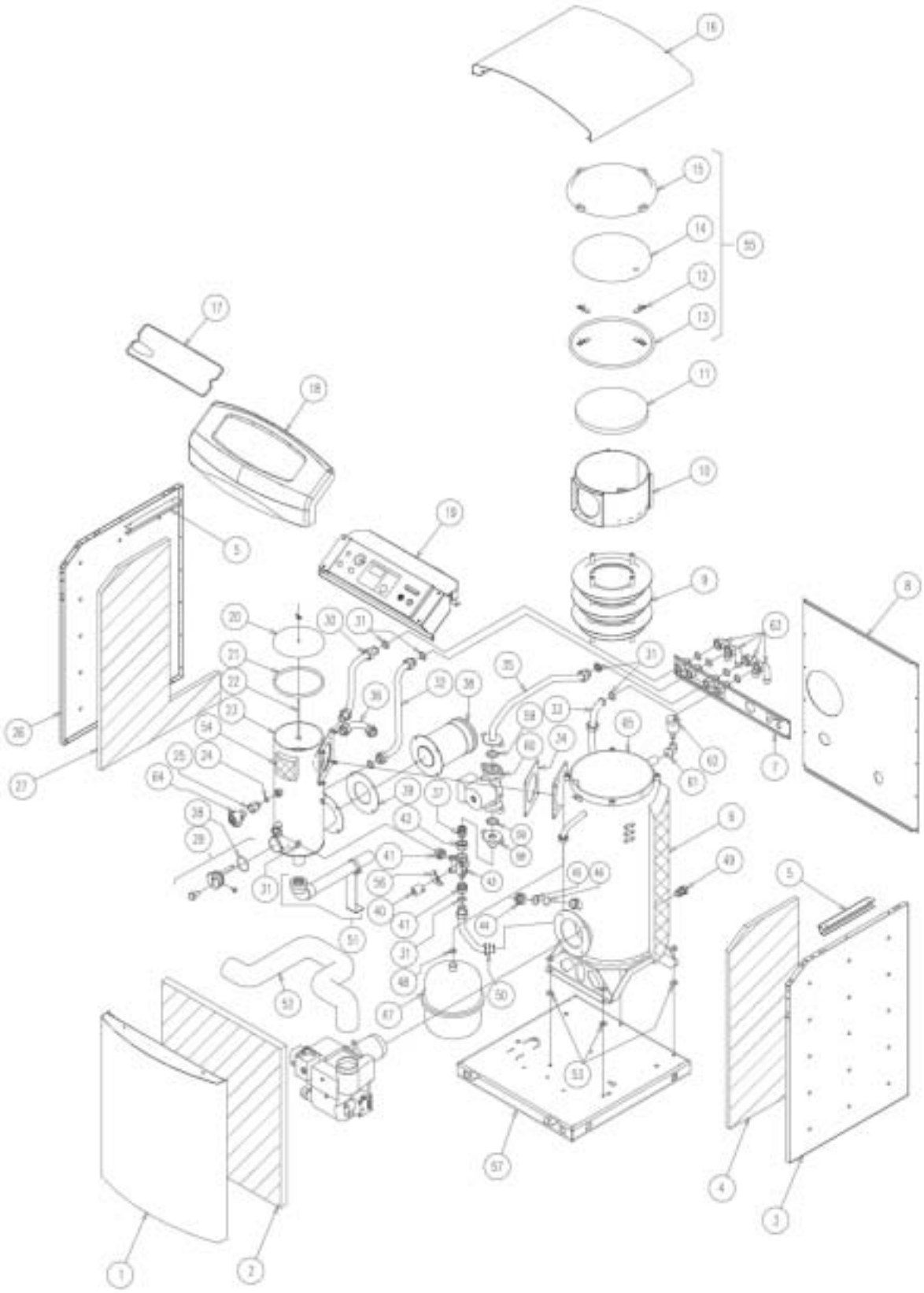
VII - PARTS BREAKDOWN

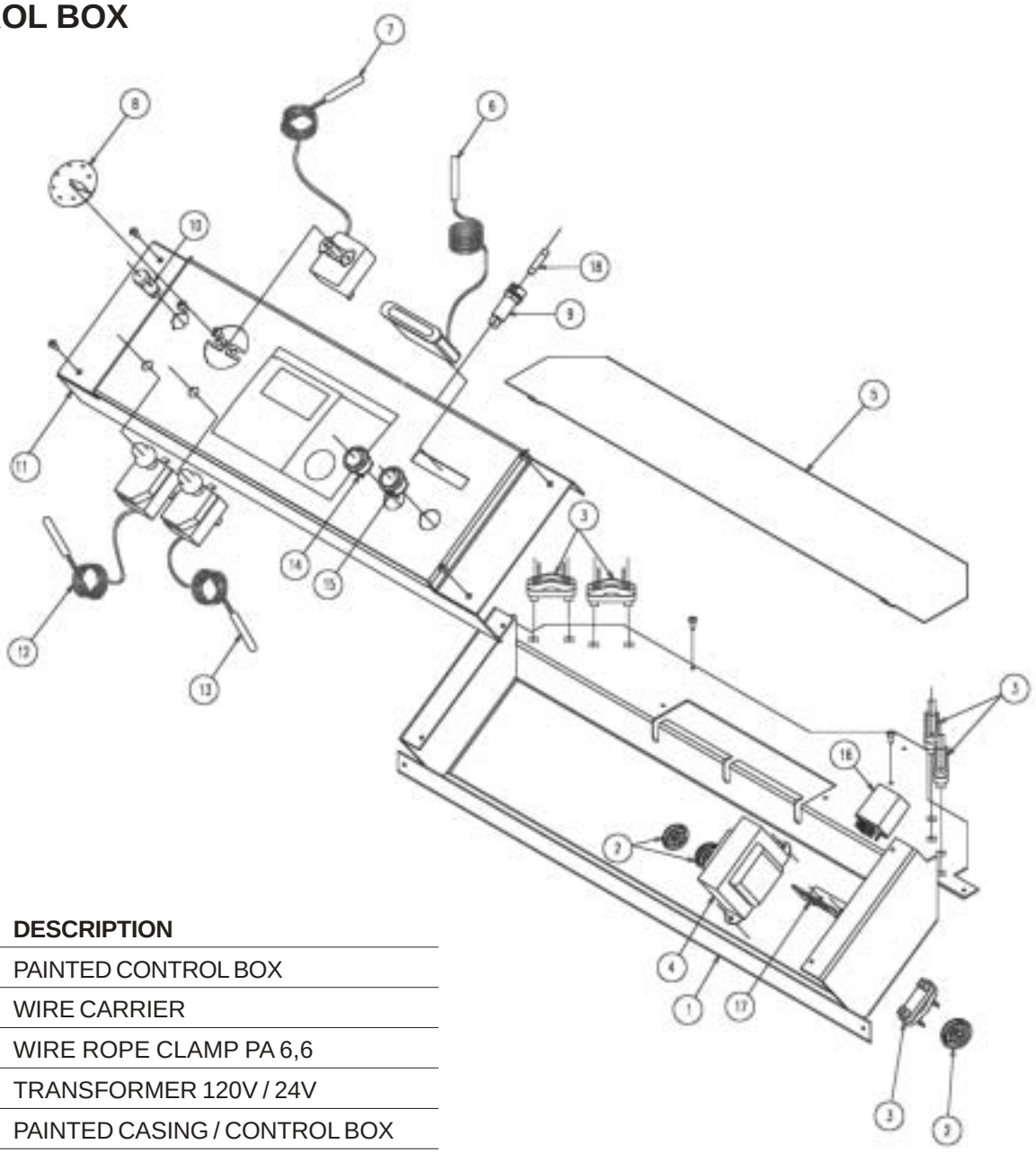


FCX

	MPI PARTS #	DESCRIPTION
1	2300	FRONT COVER EQUIPPED
2	2301	INSULATION FRONT COVER
3	2302	RIGHT HAND SIDE COVER EQUIPPED
4	2303	INSULATION RIGHT HAND SIDE
5	2367	FOLDED NECK
6	2368	INSULATION FOR SYSTEM SHELL
7	2304	PAINTED CONNECTING FLANGE
8	2305	PAINTED BACK COVER
9	2362	SWIRLERS
10	2369	COMBUSTION CHAMBER
11	2366	MINERAL WOOL 90 KG DISK DIAMETER 262X20
12	2370	FASTENING ANGLE
13	2371	GLASS FIBER INSULATION LG 950-CAST PLATE
14	2306	CERAMIC FIBER INSULATION D.280X20 (300°C)
15	2372	HEATING SYSTEM SHELL- CAST IRON
16	2307	TOP COVER EQUIPPED
17	2308	PROTECTING COVER
18	2309	ABS PROTECTION
19	2359	ELECTR. CONTROL BOX + CABLE
20	2373	CONDENSER COVER
21	2311	TOP RING CONDENSER
22	2312	FASTENING FLANGE FOR CONDENSER COVER
23	2374	CONDENSER (secondary heat exchanger)
24	2313	SEAL AFM34 D. 18,6 X 12 2 MM THICKNESS
25	2360	BRASS CONNECTION M1/2 - F3/4 NPT
26	2314	LEFT HAND SIDE COVER EQUIPPED
27	2315	INSULATION LEFT HAND SIDE
28	2316	NITRILE O'RING D. 50X4 70 SHORE
29	2376	CLEANING CAP FOR CONDENSER EQUIPPED
30	2377S	HEATING RETURN 2. CIRCUIT SHORT
31	2317	SEALING AFM34D 30X21X3
32	2377L	HEATING RETURN 1. CIRCUIT LONG
33	2378	HEATING FLOW 2. CIRCUIT
34	2318	SEALING ON CONDENSER FLANGE
35	2379	HEATING FLOW
36	2380	HEATING SYSTEM SHELL RETURN
37	2381	MALE CONNECTION 3/4
38	2363	ADAPTOR FOR VENTOUSE D.80-125
39	2319	SILICONE SEALING D.162X85X4
40	2320	BLACK HANDLE (FOR H3MG VALVE)
41	2321	REDUCED MESSING NIPPLE M1-M3/4
42	2322	NUT
43	2323	BRASS VALVE
44	2324	NUT FOR FLANGE 1" (FOR PIPE D.22,5)
45	2325	STAINLESS STEEL WASHER 30,4X25,5X0,3
46	2326	SIGHTGLASS PYREX D.30X5
47	9012	EXPANSION TANK, VESSEL 8L MALE 3/4
48	2327	SEALING AFM34 D 24X17X3
49	2328	DRAIN VALVE WITH CAP M 1/2 - M 3/4
50	2383	HEATING FLOW BEFORE 1. CIRCUIT
51	2329	CONDENSATE DISCHARGE
52	2330	FRESH AIR INTAKE HOSE
53	2331	MINERAL CARBOARD WASHER D. 25X8,5X3
54	2384	INSULATION CONDENSER FCX
55	2385 EQUIPPED	HEATING SYSTEM SHELL COVER FOR FCX
56	2332	VALVE STOP
57	2386	BASE FOR FCX
58	2387	FLANGE
59	2333	SALMSON SEALING 1 1/2 DIA 44 X 32 X 3
60	2388	CIRCULATING PUMP GRUNDFOSS 115 UPS15.42 F-9H
61	2389	BEND 90° F3/4-F3/8
62	2334	AUTOMATIC DRAIN 3/8 WITH ISOLATING VALVE
63	2335	FLOW/ RETURN BEND F1-F22
64	2336	SAFETY VALVE 30 PSIG MAL/FEM. 3/4 NPT
65	2385	HEATING SYSTEM SHELL; EQUIPED
*	2337	SEAL VITON D.80
*	2338	FIXING PIECE FOR THE COVER (MALE)
*		BOLT (PVC)
*		BAFFLE PLATE F400-F E/FEA-FCX (250X200X1,5)
*		DISK FOR ISOLATION (KERLANE)

* NOT SHOWN ON THE DRAWING

FCX CONTROL BOX



	MPI PART #	DESCRIPTION
1	2340	PAINTED CONTROL BOX
2	2341	WIRE CARRIER
3	2343	WIRE ROPE CLAMP PA 6,6
4	2342	TRANSFORMER 120V / 24V
5	2344	PAINTED CASING / CONTROL BOX
6	2345	THERMOSTAT RECT HORIZ 69X14 LG CAPIL.1500 MM
7	2346	THERMOSTAT 50/70° C SINGLE CONTACT
8	2347	WATER TEMP. CONTROL KNOB
9	2357	FUSE HOLDER WICKMANN REF 19820+19835
10	2349	RED LIGHT 230V - 120) FLAT HEAD
11	2350	CONTROL PANEL + STICKER
12	2351	SAFETY THERMOSTAT 110 CAP 1,5M TG400
13	2352	SAFETY THERMOSTAT 120 CAP 1,5M TG400
14	2353	UNIPOLAR SWITCH D. 23 / GREEN LIGHT
15	2354	UNIPOLAR REVERSIBLE SWITCH D. 23 BLACK
16	2355	OMRON RELAY
17		UPPER FASTENER FOR THE RELAY
18	2356	FUSE 6.3AMP 5X20
*	2358	WIRING FOR FCX
*	2359	ELECTR. CONTROL BOX + CABLE

* NOT SHOWN ON THE DRAWING